

Forecast e-commerce impact on international subsidies from Terminal Dues

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Abstract

In this paper, we assess how changes in the terminal dues regime and changes in the future mail flow affect the subsidies (net financial transfers) between postal operators. Our dynamic model takes as a starting point a conservative, focused forecast for growth in packet mail (E format) in key trade flows from Asia. We show how a proposed change of regulation by the UPU will impact the subsidies between postal operators. Our forecasting exercise leads us to conclude that e-commerce trends in shipment of bulky items (e.g. e-commerce) will exacerbate significantly the financial transfers resulting from the terminal dues remuneration. Moreover, the proposed changes to the terminal dues remuneration (being considered for the 26th Universal Postal Congress in Istanbul) will imply a very small moderating effect to this development, leaving the pattern and magnitude of forecasted subsidies unchanged.

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1. Introduction

The UPU is an intergovernmental organization and a global forum for cooperation between postal sector players, originally founded in 1874. At that time, the organization included 21 member countries. Today, 220 countries and territories are part of the UPU. Amongst other things, the UPU sets the rules for international mail exchanges between designated postal operators in its member countries. An essential part of this work concerns intergovernmental agreements governing *terminal dues* - payments between designated postal operators for the transport, sorting, and delivery of cross-border letter post¹ items in the destination country.

In 2013, 3.5 billion cross-border letter post items were sent globally.² Terminal dues affect all cross-border deliveries of letter mail (either directly or indirectly)³ and thus, these payments are very important for designated postal operators. As some cross-border letter post traffic grows, spurred by the positive development in e-commerce, the importance of terminal dues will likely increase.⁴ Terminal dues thus affect designated postal operators across the whole world. The amount of cross-border letter post sent to and from its country influences the degree to which terminal dues affect an individual postal operator. Data on global letter post flows within and between regions demonstrates that the main flows of cross-border letter post are between industrialised countries.⁵ This suggests that designated operators in these countries would be most affected by any changes to the current level of terminal dues. However, with an increasing share of citizens in Western Europe and North America shopping at online marketplaces in Asia, the flow of cross-border letter mail from Asia to Western Europe and North America is increasing. As a result, designated operators in these countries will also be significantly affected by any changes to the current terminal dues system.

The current UPU system for terminal dues is divided into two separate classifications. It consists of a target system and a transitional system. For the target system, the rates are based on domestic tariffs, although subject to caps and floors. The level of the caps and floors depend on a group classification. In practice, however, caps and floors are so close to each other that the terminal dues applied by target countries for inbound letter mail often is a fixed rate, which is not aligned with the domestic tariffs. The UPU have

¹ Terminal dues apply to “small letters”, “large letters” (sometimes referred to as “flats”), and “bulky letter” (sometimes referred to as “small packets”), defined by a set of minimum and maximum dimensions and weights. **Small letters (P)** are defined by the characteristics; Minimum dimensions: 90 x 140 mm, Maximum dimensions: 165 x 245 mm, Maximum weight: 100 g, Maximum thickness: 5 mm. **Large letters (G)** are characterized as items that cannot be classified as small letters; Minimum dimensions: 90 x 140 mm, Maximum dimensions: 165 x 245 mm, Maximum weight: 100 g, Maximum thickness: 5 mm. **Bulky letters or small packets (E)** (a non-standard envelope or parcel up to 2 kg) are characterized as items classified neither as small letters nor as large letters; Minimum dimensions: 90 x 140 mm, Maximum dimensions: 900 mm length, width and depth combined, with the greatest dimension not exceeding 900 mm, Maximum weight: 2 kg (5 kg for items containing books or pamphlets), cf. UPU 2015 Statistics and Accounting Guide.

² UPU, *Development of postal services in 2013*, p. 4, 2014. This corresponds to 1 percent of total letter post traffic world wide.

³ For letter post flows where postal operators have negotiated bilateral agreements, terminal dues are still relevant as they work as a fall-back option in the negotiations. I.e. the bilaterally negotiated rates are usually not very different from the terminal dues. Terminal dues under the REIMS V agreement are not publicly available, but under REIMS II, terminal dues were set at 80 percent of the domestic price for a single-piece priority letter, i.e. not very different from the uncapped UPU rates.

⁴ E-commerce deliveries are to a large extent sent by letter post (as “bulky letters” or “small packets”, see for example UPU, *Fulfilling the global e-commerce promise*, 2014 and UPU, *Union Postale no.4*, December 2013, p.17

⁵ According to UPU, *Development strategies for the postal sector: An economic perspective*, Chapter 8: Global postal connectedness, p. 196, 2014, 43 percent of total international letter post flows (measured in kg) were intra Western Europe and 15 percent were between Western Europe and North America.

proposed an update of the regulation of the terminal dues rates. The update is a continuation of the current system, but with a few adjustments. There are two alternatives outlined by the Postal Operations Council (POC), the technical and operational body of the UPU⁶. However, one option has been adopted by the POC and is the one expected to be approved in Istanbul in September 2016. If so, it will be effective from first of January 2018. Perhaps most noticeable, the new regulation will separate terminal dues charges for the different post letter formats.

While the purpose of terminal dues system is to compensate the destination country for the cost associated with the handling, transport and delivery of letter post items from the foreign country, the amount of compensation for each bilateral mail flow is not a direct translation of the costs, nor the price of equivalent domestic services. If the regulated compensation differ significantly from the value of the services conducted, this can be interpreted as a market distortion in the international mail market. The reports by Copenhagen Economics (2014, 2016) introduced a model of such distortions and develops an empirical method for quantifying the effects of the current terminal dues system in monetary terms. Three types of market distortions have been identified⁷:

1. Distortion of competition for (i) last-mile handling and (ii) first-mile handling of cross-border letter post items
2. Distortion of demand for (i) delivery within and outside the terminal dues system, (ii) domestic versus cross-border delivery, and (iii) cross-border delivery originating in transition versus target countries
3. Financial transfers between postal operators

This paper focus on the financial transfers between postal operators.

1.1. Model of distortion –the concept of financial transfers

Financial transfers between designated postal operators occur in cases where (compared to a counterfactual situation with non-distortionary terminal dues) the sending postal operator today overpays or underpays for last-mile delivery in the destination country. An underpayment for delivery implies a financial transfer from the receiving postal operator to the sending one. Similarly, an overpayment for delivery implies a financial transfer from the sending postal operator to the receiving one. By looking closer into the dynamics of the financial transfers, we can get an indication of how these market distortions could develop in the future.

The terminal dues rates influence the financial position of postal operators, given their bilateral mail flows, via two channels: inbound cross-border flows (import volumes) and outbound cross-border flows (export volumes). On the inbound side, the effect (for a specific postal operator and a specific bilateral mail flow) equals the difference between the terminal dues charged and the counterfactual rate times the amount of inbound letter post items. If the terminal dues rate is below the counterfactual rate, this implies a negative financial transfer for the receiving operator. On the outbound side, the effect

⁶ UPU, *POC 2016.1–Doc 12h*, 2016

⁷ Copenhagen Economics, *The Economics of Terminal Dues*, 2014, report prepared for the Postal Regulatory Commission, Available at http://www.prc.gov/sites/default/files/reports/The%20Economics%20of%20Terminal%20Dues_final%20report%20300914.pdf

(for a specific postal operator and a specific bilateral mail flow) equals the difference between the terminal dues paid and the counterfactual rate in the destination country times the amount of outbound letter post items. If the current terminal dues rate charged by the destination country is below the counterfactual rate in the destination country, this implies a positive financial transfer for the sending operator.

2. Our analysis

2.1. Scenario of increased e-commerce

There is an ongoing trend in international postal markets. The widely spread growth in e-commerce is calling for more small packets to be sent. Many of these packets are sent via bulky letters from exporting countries in Asia to importing countries in Europe and North America. In this paper, we model a simplified scenario, which takes departure in the estimated flows for 2014, and assume that some flows of bulky letters, ie. the E-format, will grow in the coming years. We select a set of exporting countries, namely China, Hong Kong, India, Singapore and Malaysia. We then scale up all the flows of the E-format going from these countries to a selected 41 countries consisting of OECD, EU-28 Brazil and Russia, by an annual growth rate of 50%.⁸ Although one could also take into account that other letter formats will potentially decrease in volume, causing the total amount of international letters to fall, we have decided to leave all other mail flows intact.

2.2. A model for estimating financial transfers

In order to estimate the financial transfers created by the terminal dues system, we have created a model that compares the terminal dues received/paid by designated postal operators worldwide in two situations: (i) the actual situation with the set of terminal dues reflecting the framework of the UPU and (ii) a counterfactual situation with an alternative set of non-distortionary terminal dues. We take departure from the 2014 estimates of international postal flows and current regulation and move on to a situation with increased e-commerce and the new regulatory framework. We assume for this exercise that all countries follow the terminal dues system in place. In reality, we know that some postal operators make use of other agreements.

An important part of the analysis is to state an appropriate counterfactual situation. The counterfactual terminal dues could for example be defined by the prices of similar domestic delivery services. However, since these tariffs are not always available in the public domain, previous studies have often used a set of counterfactual terminal dues rates set at a percentage (typically 70-80 percent⁹) of the domestic postage rates for end-to-end delivery of single-piece letters of three formats (small letters, large letters, and small packets). Since the UPU also base their analysis on 70% of domestic tariffs, it is a good starting point.

The net effect of a country's postal operator will be determined by the difference between the actual terminal dues rate (2) and the equivalent domestic postage rates (3) times the

⁸ This growth rate is based on aggregate estimates of bulky letters from the UPU's IPK studies and a study made by the OIG specifically on the growth of e-letters from Asia into the US. See UPU, POC C3 LPRG 2014.2 Doc 4a, *Results of the items per kilogramme (IPK) study, 2014* and Office of Inspector General, *Inbounding China ePacket Costing Methodology, 2014*.

⁹ 70 percent of the domestic postage rates is also used by the UPU as the benchmark when calculating terminal dues before adjusting for caps and floors.

mass of mail (1) for each bilateral mail flow. This is described algebraically in annex B. The total distortion, ie. the total net effect, is then the sum of all countries with the same sign. The nature of this phenomenon is that the sum of negative net effects equals the sum of the positive net effect.

2.3. Elements in the model and data collection

The model consists of three main elements:

- a) Bilateral flows of letter mail up to 2kg between all designated postal operators (in number of items and weight), split by letter format (P, G, E)¹⁰
- b) Actual terminal dues rates for each bilateral mail flow
- c) Counterfactual terminal dues rates for each bilateral mail flow

While complete primary data is not available in the public domain, we use multiple sources as inputs to construct reliable estimates for each element. Most of the inputs are provided by the UPU.¹¹ Our data strategy is described in detail in annex B. Its key features and assumptions are:

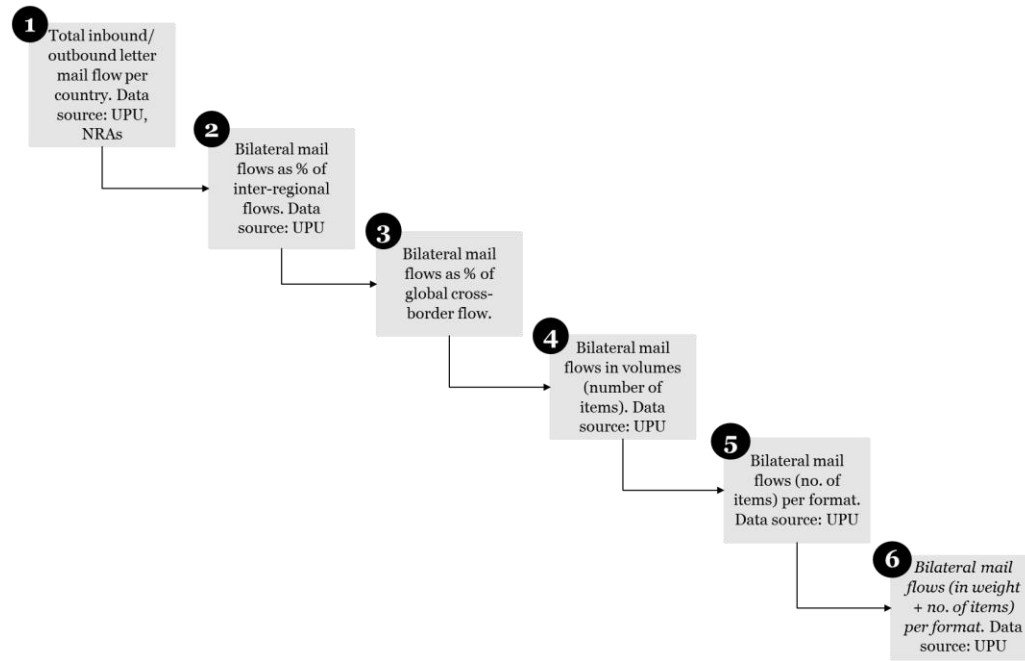
a) Bilateral flows of letter mail up to 2kg between all designated postal operators
We use estimates of the *total* inbound and outbound mail flow (in terms of number of items) for individual countries. This results in a data set of inbound and outbound volumes (in number of items) for 182 countries and territories. We then set the estimates of inbound and outbound flows for each designated postal operator relative to the inter-regional mail flows to and from for the region where the postal operator is located. This provides us with a ratio of the inbound (outbound) flow relative to the total inbound (outbound) flow of the region. Here we make an important assumption about *proportional regional participation* (see annex B). By applying this assumption, we are able to estimate data points for *each bilateral mail flow* as a percentage of the global cross-border mail flow in 2014. We can then multiply it with the global volume of international mail in order to get each flow measured in items. Using data on regional distribution of letter format, we are able to split each bilateral mail flow according to the different letter formats. We here need to assume that the distribution of P, G and E items in a specific bilateral mail flow between two regions is the same as the distribution of P, G, and E items in the total inter-regional mail flow between the same two regions. By using information of average weight for each product type, we are then able to get an estimate for each flow measured in both weight and items for each format. For the new

¹⁰ **Small letters (P)** are defined by the characteristics; Minimum dimensions: 90 x 140 mm, Maximum dimensions: 165 x 245 mm, Maximum weight: 100 g, Maximum thickness: 5 mm. **Large letters (G)** are characterized as items that cannot be classified as small letters; Minimum dimensions: 90 x 140 mm, Maximum dimensions: 165 x 245 mm, Maximum weight: 100 g, Maximum thickness: 5 mm. **Bulky letters or small packets (E)** (a non-standard envelope or parcel up to 2 kg) are characterized as items classified neither as small letters nor as large letters; Minimum dimensions: 90 x 140 mm, Maximum dimensions: 900 mm length, width and depth combined, with the greatest dimension not exceeding 900 mm, Maximum weight: 2 kg (5 kg for items containing books or pamphlets), see. UPU 2015 Statistics and Accounting Guide

¹¹ Much of our data is collected from documents, publications, and databases from the Universal Postal Union, for example UPU, *UPU Postal Statistics database*, 2015, http://pls.upu.int/pls/ap/ssp_report.main?p_language=AN&p_choice=BROWSE; UPU, *Development strategies for the postal sector: An economic perspective*, 2014, http://www.upu.int/uploads/tx_sbdownloader/publicationTrendsDevelopmentStrategiesForThePostalSectorEn.pdf; UPU, *Development of postal services in 2013*, 2014, <http://www.upu.int/fileadmin/documentsFiles/resources/postalStatistics/developmentOfPostalServicesIn2013En.pdf> and UPU, POC C3 LPRG 2014.2 Doc 4a, *Results of the items per kilogramme (IPK) study*, 2014. We complement this with recent research of domestic postage rates from WIK Consult (2013).

scenario, we simply scale up the targeted mail flows of the E-format by 50% annually. Figure 1 illustrates systematically how we estimate the mail flows.

Figure 1 Process map for estimating postal flows



Source: Copenhagen Economics

b) Actual terminal dues rates for each bilateral mail flow

Actual terminal dues rates are calculated directly based on the UPU methodology set out in the 25th UPU congress for the period of 2014 through 2017 (see annex B). For the new scenario, we base our terminal dues rates on the Proposal for the UPU terminal dues system for the 2018–2021 cycle, as outlined by the UPU. The new regulatory system builds on the current one, but adds in particular a separate calculation for the bulky letters. In both systems, for each bilateral mail flow the effective rate will depend on (i) the group to which a postal operator belongs, (ii) from which country the inbound mail flow is coming, and (iii) whether or not the terminal dues for the bilateral flow in question is subject to a cap or floor.

c) Counterfactual terminal dues rates for each bilateral mail flow

The counterfactual terminal dues rates should ideally reflect (for each country) the price for last-mile handling of cross-border letter post items that a private company (not part of the UPU) would pay. We depart from the domestic, end-to-end postage rates for single-piece items of the three different formats (P, G, E) and several different weight steps within each format. This is combined with information on the distribution of weight steps and the average weights. By estimating the distribution of weight steps in each country we get a good estimate of the average price for each format in each country. Similarly to the calculation of actual terminal dues charges we apply an adjustment factor of 70 percent.

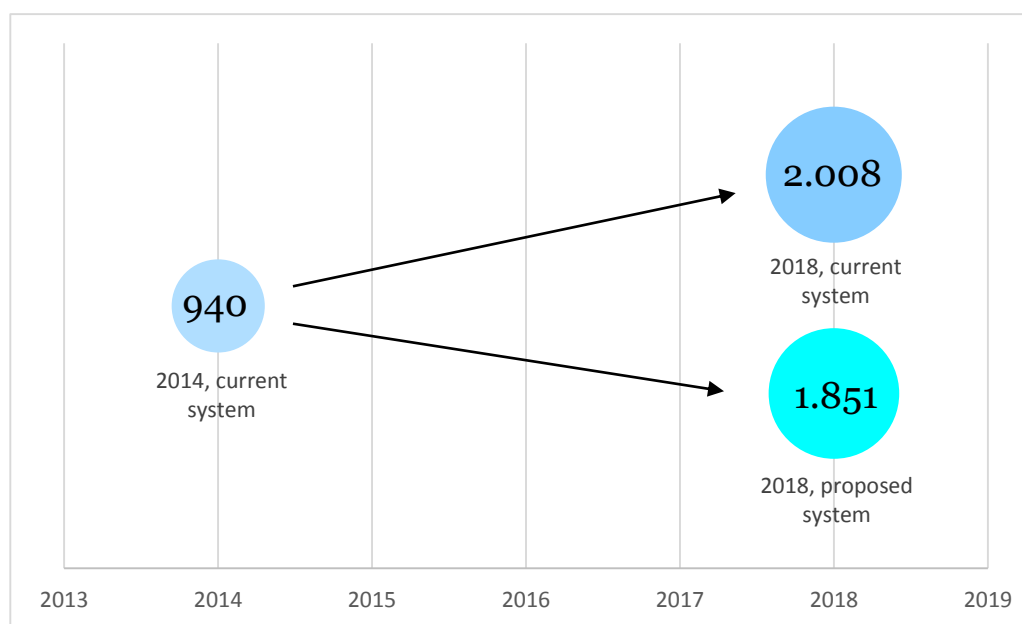
3. Results

Based on the concept of financial transfers and our empirical model we have been able to estimate the distortion in monetary terms. We have as a starting point an estimate for 2014, in which the current system is in place. Further, we have applied the forecasted developments in the volumes of small packets (the E-format) to make an estimation for a future scenario, where the proposed new system is applied. As a comparison, and to give an indication of the forecasted impact of the new system, we have also applied the future scenario with the current system. While the exact magnitudes of the financial transfers rely on our assumptions, the mechanisms at work due to the system of terminal dues are illustrated by our result.

3.1. The total value of financial transfers

In 2014, the total value of the net financial transfers is estimated to 940 million SDR, approximately 1.168 million EUR¹². For our forecasted scenario with the new proposed system, the total value of the net financial transfers is estimated to 1.851 million SDR, approximately 2.301 million EUR. This is an increase by 97%. When we apply the increased flows, but keep the current system of terminal dues charges, the total value is estimated to 2.008 million SDR, approximately 2.496 million EUR. This is 8% higher than with the new system, see figure 2. The total net financial transfer that comes from small letters (P) and flats (G) are the essentially the same with and without the change in system, whereas the small packets (E) are smaller with the new system. The small packets accounts for 90% of the total value of financial transfers in our forecasted scenario.

Figure 2 Total value of net financial transfers, (Million SDR)



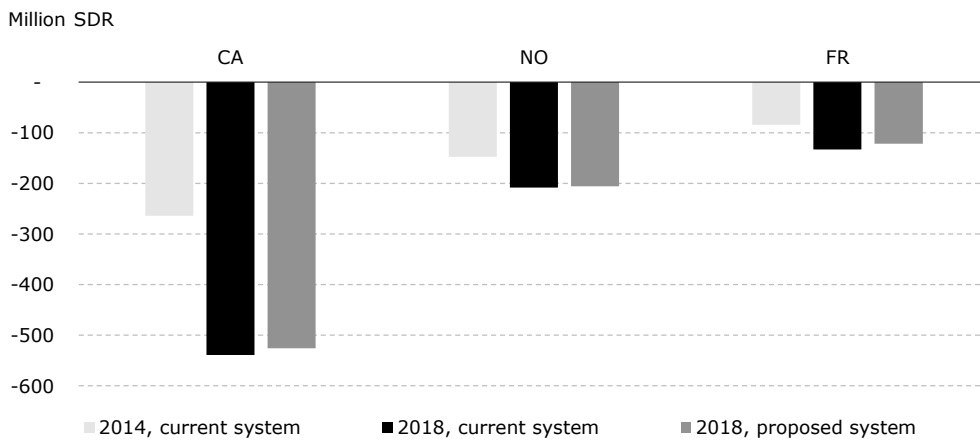
Source: Copenhagen Economics based on model data

¹² One SDR is on 29th of April 2016 equal to approximately 1,24 EUR. See https://www.imf.org/external/np/fin/data/rms_five.aspx

3.2. Patterns of change

Even though the discount given (ie. the difference between the terminal due charge and the equivalent domestic postage) is smaller for many bilateral flows with the new system the total net effect is larger compared to 2014 since the volumes of the important format, the small packets (E) increase. The postal operators that have significant negative financial transfers with the selected exporters of e-commerce packets will have an increased negative effect in the forecasted scenario, compared to 2014. For one group of postal operators, that already had a negative effect in 2014, see an even larger negative effect in our future scenario, see figure 3. For example, Canada see a negative effect of 526 million SDR in 2018 with the proposed system. This is equivalent to approximately 654 million EUR.

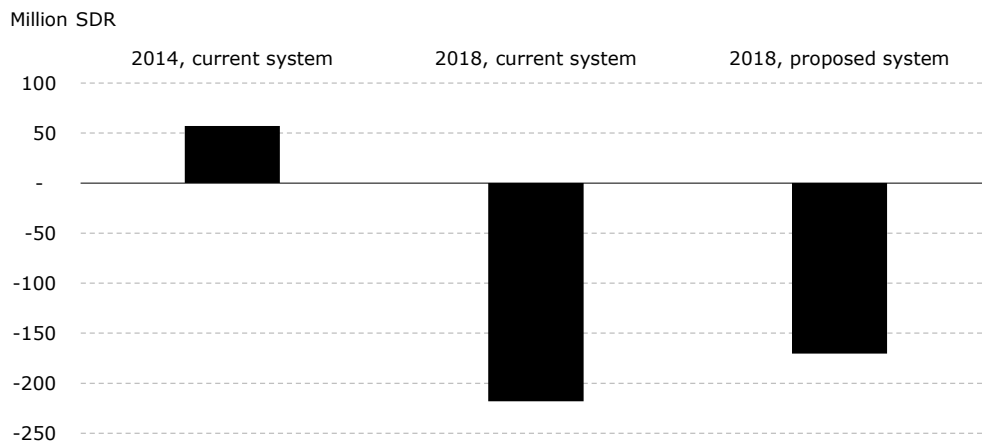
Figure 3 Countries with larger negative effect



Source: Copenhagen Economics based on model data

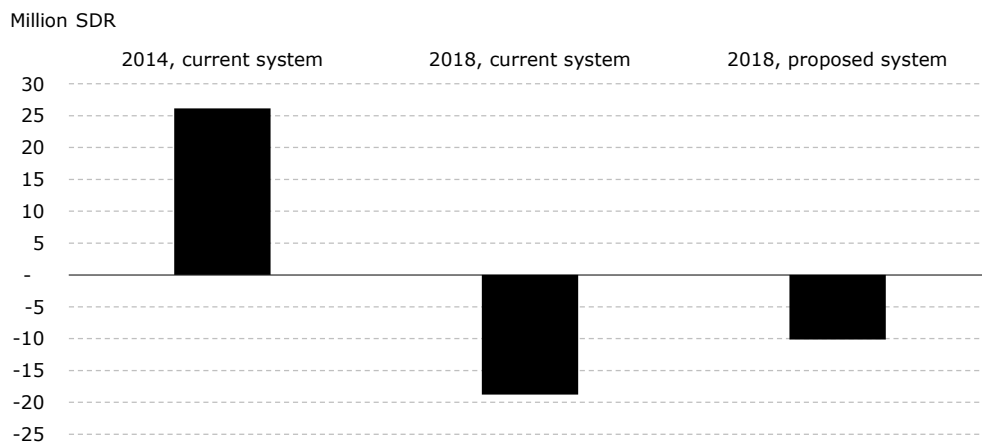
Another group of postal operators, that had a positive net effect in 2014, see a shift from positive towards negative effect in 2018. These countries had a positive net effect from the small letters (P) and flats (G) in 2014 that outweighed the negative effect from the small packets (E). In the forecasted scenario, the increase in small packets from Asia make the total effect smaller or negative. In the case of United States and Great Britain the shift goes from a significant positive to a large negative effect in 2018, see figure 4 and 5. The effect for the United States is estimated to negative 170 million SDR, approximately 212 million EUR. We can see however, that the effect would have been larger if the current system remained, but this alleviation is rather small. In the case of Germany, the developments shift the effect towards zero, see figure 6.

Figure 4 Countries with effect going negative: United States



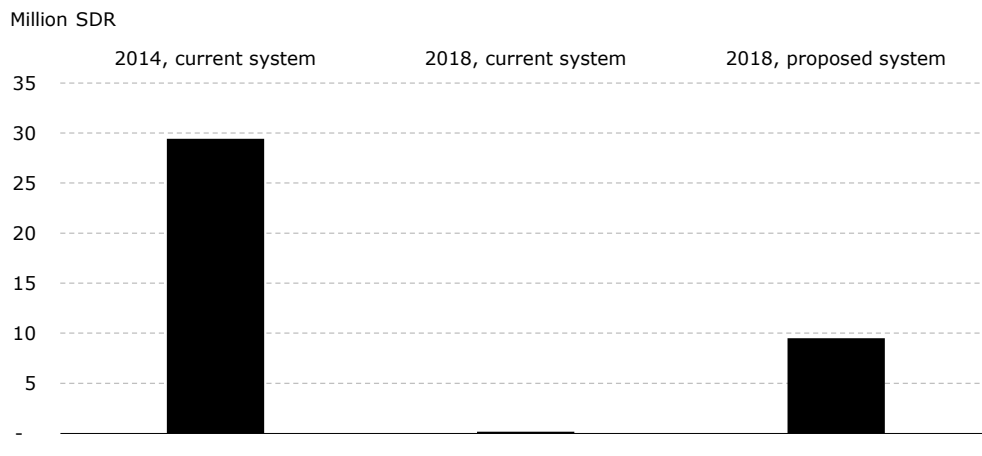
Source: Copenhagen Economics based on model data

Figure 5 Countries with effect going negative: Great Britain



Source: Copenhagen Economics based on model data

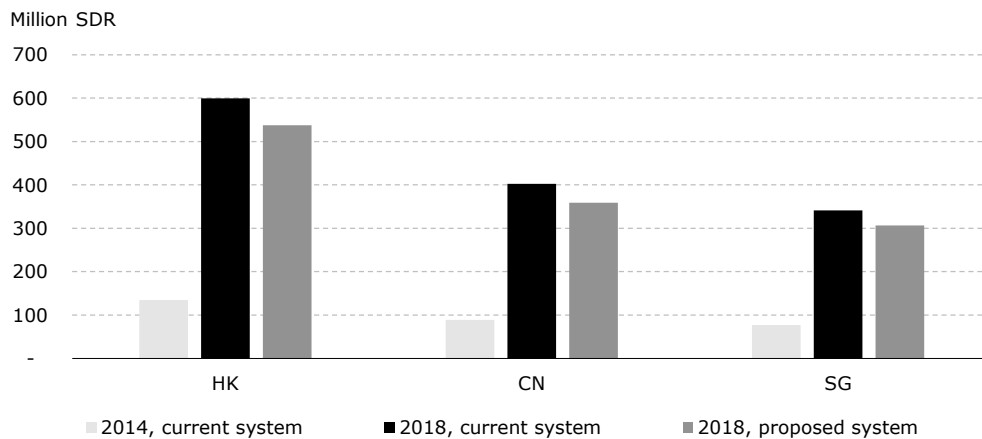
Figure 6 Countries with effect going negative: Germany



Source: Copenhagen Economics based on model data

For the selected exporting countries we can see that the effect increase from 2014. This is of course not surprising since the volumes that had the largest effect in 2014 increase substantially in our new scenario. Figure 7 shows the net financial transfers for three selected countries with positive net effect in the new scenario, China, Hong Kong and Singapore.

Figure 7 Countries with larger positive effect

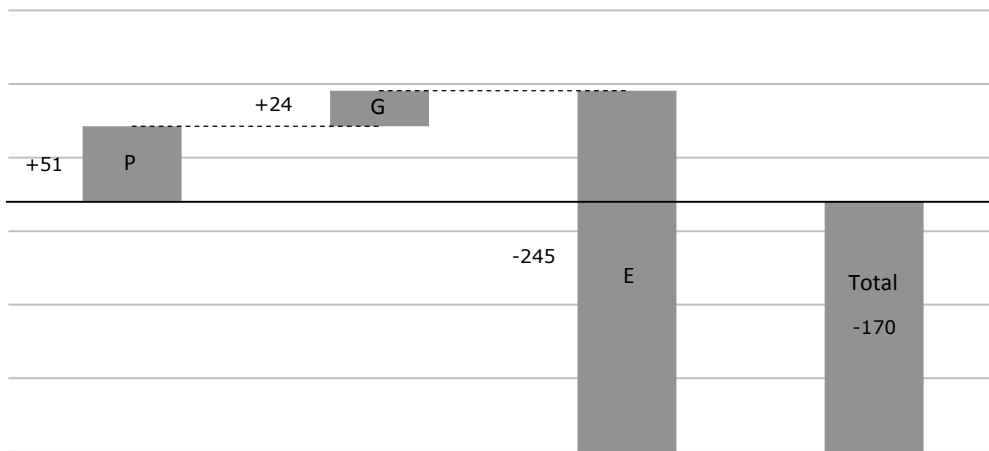


Source: Copenhagen Economics based on model data

3.3. The effect of the small packets (E)

For those postal operators that see a shift from positive towards negative the impact of the growing e-commerce is very clear. The net effect from the small letters (P) and flats (G) are still positive in the future scenario. However, the large distortionary effect from the small packets (E) projects them towards a negative effect. See figure 8, 9 and 10.

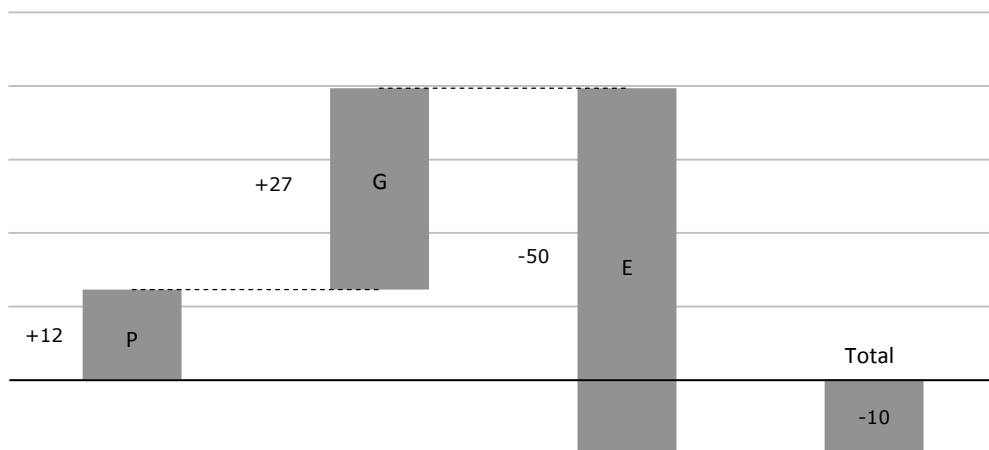
Figure 8 The net effect by letter format for the United States



Note: The graph shows the forecasted net effect for the United States postal operator in 2018 with the proposed new system.

Source: Copenhagen Economics based on model data

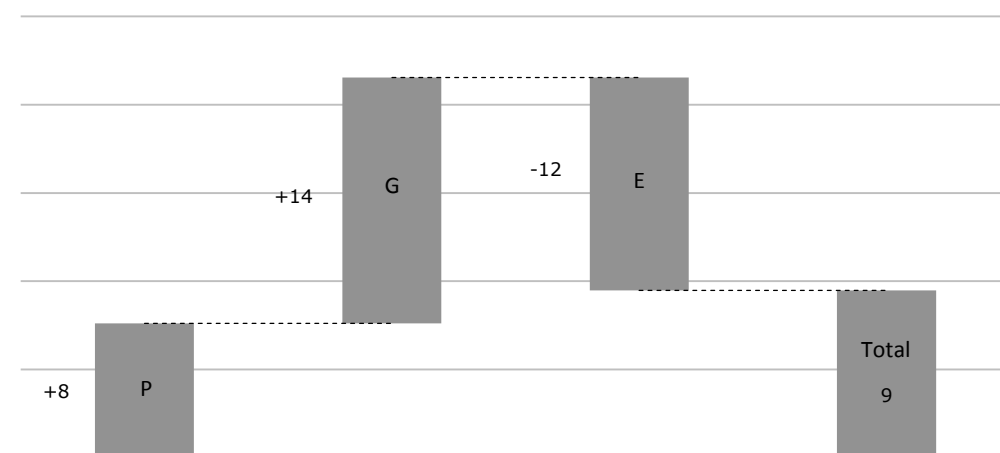
Figure 9 The net effect by letter format for Great Britain



Note: The graph shows the forecasted net effect for the British postal operator in 2018 with the proposed new system.

Source: Copenhagen Economics based on model data

Figure 10 The net effect by letter format for Germany



Note: The graph shows the forecasted net effect for the German postal operator in 2018 with the proposed new system.

Source: Copenhagen Economics based on model data

4. Implications

International subsidies are expected to increase. Our results indicates that with a significant increase in small packets, due to e-commerce, the total value of financial transfers are likely to increase in the future.

The reforms under consideration have no material effects. The new regulatory system proposed by the UPU shows a very small mitigating effect on the financial transfers, without altering significantly neither the pattern nor the magnitude.

Losers will suffer even more. The countries that showed the largest negative effect in 2014 see an even larger negative effect going forward.

Some winners will become losers. Our results further indicate that some countries that today do not suffer losses from the system are likely to experience a shift towards a negative effect

Winners will benefit even more. Our results show that the key postal operators benefiting already from subsidies from other countries will continue to have very large positive financial transfers.

The expected growth in small packets is the driver of these distortions. The distortionary effect from the small packets (E) remains the main source for the financial transfers in the global mail market. Indeed, our forecasting analysis shows the significant effect that the expected growth in e-commerce driven shipments of small packets (E format mail) will have on magnifying the cross-operator subsidies arising due to the Terminal Dues remuneration system.

Annex A – Supporting information

The UPU system

The UPU system for terminal dues is a two-tiered system dating back to 1989. It consists of a target system and a transitional system.

- The *transitional system* mainly applies to exchanges to, from, or between designated operators in countries considered “developing”.
- The *target system* mainly governs the exchange of letter post items between designated operators in countries and territories previously thought of as “industrialized”.¹³ In 2010, countries and territories classified as “developing” began to join the target system. The new system includes 117 countries and territories.

Countries in the transitional system can opt in to the target system, but not the other way around.¹⁴ Depending on when they joined the target system or when it is foreseen that they will join the target system, UPU members are divided into 6 groups. The terminal dues received by a designated postal operator for the last-mile handling of cross-border letter post depend on the terminal dues group to which group it belongs as well as on the terminal dues group to which the sending postal operator belongs. Countries or territories part of the target system pay each other target rates, while terminal dues to, from, and between countries or territories in the transitional system are paid at what is called transitional rates.

The terminal dues rates for the two rate systems are based on different parameters. In general, the rates in the transitional system are lower than the rates in the target system. For *the transitional system*, the UPU prescribes rates (for delivering inbound letter mail) that have both per item and per kilogram components, which are then converted into a per kilogram rate.¹⁵ These per item and per kilogram rates for the transitional system are equal to the floor of the target system for any given year.

For *the target system*, the rates (for delivering inbound mail) are based on 70 percent of the domestic tariff for a 20-gram priority small letter and a 175-gram priority large letter, though subject to caps and floors (per item and per kilogram). The *level* of the floors and caps depend on group classification. In practice, however, caps and floors are so close to each other that the terminal dues applied by target countries for inbound letter mail often is a fixed rate, which is not aligned to the domestic tariffs. In addition to this, terminal dues are adjusted based on the quality of service of mail delivery.¹⁶ The caps and floors have a set annual growth rate depending on group. The cap rates in the target system increase with 3% per year for group 1.1 and 6% per year for group 1.2 and 2, while the floor rates increase with 2,8% for both groups.

¹³ Classification is from the United Nations Social and Economic Council.

¹⁴ Campbell, *Estimating the effects of UPU terminal dues 2014-2017*, 2014 and UPU, *Statistics and Accounting Guide*, 2015.

¹⁵ For mail flows below 75 tons, an average number of items per kilogram of mail is applied to these per item and per kilogram rates to develop one per kilogram rate for transition countries.

¹⁶ For operators in target countries with annual inward mail flows above 100 tons and for operators in the transition system that choose to participate, terminal dues are adjusted according to quality of service. This can result in a bonus or penalty of 5 percent of the base rate. In addition to this, postal operators in groups 1.1, 1.2, and 2 pay into a Quality of Service Fund for transition system operators. The fund is governed by the UPU, and distributed to postal operators in transition countries to improve postal services.

In the proposed system for the 2018 – 2021 cycle the terminal dues rates follow a similar methodology. The main difference is that the rates for small packets (the E-format) are treated separately. The target rates are still only based on data for a 20g P, and 175g G, however the E-letters are treated differently.

Annex B - Supplementary description of methodology

Description of data collection and calculations

Bilateral mail flows

Bilateral mail flows between designated postal operators are an essential input in the model. In combination with the difference between the actual terminal dues rates and the counterfactual ones (i.e. the equivalent domestic postage), the magnitude of bilateral mail flows will determine the size of the financial transfers.

In order to estimate financial net transfers in our model, we need information about bilateral flows of letter mail up to 2kg between all designated postal operators (both in number of items and in weight), split by letter format (P, G, E). As this information is not readily available in the public domain, we have to construct our own data set, based on publicly available data and reasonable assumptions about the performance of global mail markets.

Whereas we have information about flows of cross-border letter post between regions, we do not know how the cross-border volume to/from each region is disaggregated among the countries in the region. Moreover, we do not have information about the product mix (i.e., letter formats) in the volumes. For this reason, we use a number of proxies to approximate mail flows subject to UPU terminal dues.

As a first step, we create estimates of the *total* inbound and outbound mail flow (in terms of number of items) for individual countries. The starting point for this is readily available data for total inbound and outbound mail flows from the UPU¹⁷, measured in number of items. Since 2011 is the year in the UPU statistics for which we have the broadest coverage of data (139 countries and territories covered), we use this as a reference. If we cannot find information for a specific country or territory in the UPU dataset from 2011, we turn to UPU statistics from other years. This adds data points for another 31 countries. When neither of these sources can provide us with an estimate, we turn to domestic sources such as the national regulatory authorities. This adds data points for another five countries. For seven additional countries with data for domestic (but not cross-border) letter volumes, we are able to construct our own estimate of cross-border volumes by using a reasonable ratio of cross-border to domestic letter mail volumes.¹⁸ This results in a data set of inbound and outbound volumes (in number of items) for 182 countries and territories.

¹⁷ UPU Postal Statistics Database,
http://pls.upu.int/pls/ap/spp_report.main?p_language=AN&p_choice=BROWSE

¹⁸ The ratios used are based on information from previous years regarding the relationship between domestic and cross-border mail volumes. Where this information is not available, a ratio is constructed based on assumptions regarding the similarity of countries (i.e. countries of similar size can be expected to have the same ratio between domestic and cross-border flows).

As a second step, we set the estimates of inbound and outbound flows in 2011 for each designated postal operator relative to the 2011 inter-regional mail flows to and from for the region where the postal operator is located.¹⁹ This provides us with a ratio (for each designated operator) of (i) the inbound flow relative to the total inbound flow to the region and (ii) the outbound flow relative to the total outbound flow from the region.

As a third step, we make an important assumption about *proportional regional participation*, where we depart from the ratios from step two and apply them to inter-regional mail flows from 2014. By applying this assumption, we are able to estimate data points for *each bilateral mail flow* as a percentage of the global cross-border mail flow in 2014. While this methodology fails to take into account factors such as distance and international relations²⁰, it is the best available approximation of bilateral flows and does not suffer from further data gaps.

Assumption of proportional regional participation

The assumption about proportional regional participation allows us to estimate the percentage of the world's mail flow that goes from a country i in region A to a country j in region B based on the following information:

The percentage of region A's outbound flow originates in country i ,
 The percentage of region B's inbound letter mail flow that is delivered to country j
 The share of the global total cross border mail flow that goes from region A to region B

For each mail stream that goes *between countries from different regions*, we apply the following calculation:

$$X_{ij} = \frac{O_i}{O_A} \times \frac{I_j}{I_B} \times X_{AB} \quad (1)$$

For each mail stream that goes between countries within the same region, we apply the following calculation:

$$X_{ij} = \frac{O_i}{O_A} \times \frac{I_j}{I_A \times (1 - (\frac{I_i}{I_A}))} \times X_{AA} \quad (2)$$

X_{ij} = percentage of world's mail flow that goes from country i to country j

X_{AB} = percentage of world's mail flow that goes from region A to region B

X_{AA} = percentage of world's mail flow that goes within region A

O_i = total outbound mail flow from country i

O_A = total outbound mail flow from region A

I_j = total inbound mail flow to country j

¹⁹ Data for inter-regional mail flows are available in Ansón, José, and Matthias Helble, *Global postal connectedness In Universal Postal Union, Development Strategies for the Postal Sector: An Economic Perspective*. Bern: UPU, 2014.

²⁰ Factors such as distance, international relations, and a common language can be important for the mail exchange between certain countries. With respect to the growing share of cross-border e-commerce, for example, we often observe larger online trade between countries that share a common language or culture (e.g., Germany and Austria, the United States and Canada). For the case of the United States, we have tried to compensate for this by adjusting bilateral flows between the US and Canada based on publicly available information about cross-border mail flows between these countries.

I_B = total inbound mail flow to region B

The assumption in (1) and (2) is essentially the same but the calculations differ in the relative inbound. The difference is due to the fact that the total inbound flow to region A also includes mail destined for country i. This is a pragmatic solution to solve a mechanical problem in the model because we do not want to include domestic mail.

As a fourth step, we convert each bilateral flow (until now measured as a percentage of the global flow of international mail) into an estimate in terms of volumes (number of items). We do this by multiplying it with the global volume of international mail.²¹

As a fifth step, we split each bilateral mail flow according to the different letter formats (P, G, and E). In order to do this, we use a UPU survey among 49 designated postal operators that contain regional estimates for the distribution of formats (in percentage of number of items and weight).²² This study also provides estimates of the average weights per format. By assuming that the distribution of P, G and E items in a specific bilateral mail flow between two regions is the same as the distribution of P, G, and E items in the total inter-regional mail flow between the same two regions, this provides us with a per-format estimate of letter mail volumes for each bilateral mail stream.

As a sixth step, we apply the average weight for each product type (from the UPU survey referred to above) in order to get the bilateral flows measured in kilograms instead of number of items.

Based on this, we are able to estimate bilateral cross-border flows of letter post items between 183 countries and territories worldwide. Depending on the size and structure of bilateral mail flows, the current design of the terminal dues system will affect designated operators differently. For example, large outbound flows of cross-border mail may imply that designated postal operators experience large positive transfers on the outbound side. Similarly, in combination with a negative difference between actual terminal dues received and the equivalent domestic postage rate, large inbound may imply that designated postal operators experience large negative transfers on the inbound side. Understanding the structure of bilateral mail flows will thus be very helpful when trying to understand the structure of net financial transfers created by the current terminal due system.

Lastly, for the new scenario of growing e-commerce we select as set of exporting countries, namely China, Hong Kong, India, Singapore and Malaysia. We then scale up all the flows of the E-format going from these countries to any EU or OECD country by an annual growth rate of 50% from 2014 to 2018. This growth rate is based on aggregate estimates of bulky letters from the UPU's IPK studies and a study made by Ofcom specifically on the growth of e-letters from Asia into Great Britain.

Terminal dues rates in the current system

²¹ Information about global cross-border letter post volumes is available in UPU, *Development of Postal Services in 2013*, (Powerpoint presentation), 2014.

²² UPU, POC C3 LPRG 2014.2 Doc 4a, *Results of the items per kilogramme (IPK) stud*, 2014. (committee document).

Actual terminal dues rates with the current system are calculated based on the UPU methodology set out in the 25th UPU congress for the period of 2014 through 2017.²³ According to this methodology, postal operators that are part of the UPU system fall into one of six different groups (1.1, 1.2, 2, 3, 4, 5,). For postal operators in groups 1.1, 1.2, and 2 (i.e. countries in the target system), the terminal dues for inbound letter mail consists of a per-item rate and a per-kilogram rate based on 70 percent of the domestic postage for a 20g small priority letter and a 175g large priority letter. These rates are, however, subject to caps and floors depending on to which of the three groups the postal operator belongs. These caps and floors have an annual growth rate set until 2017. There is also a limit depending on the size of mail flows where a fixed per kilogram rate will apply if the total inbound mail flow is less than 75 tons. For postal operators in groups 3, 4, and 5 (i.e. countries in the transitional system), terminal dues charges are calculated as a fixed rate per kilogram if the total inbound flow from a certain country is less than 75 tons and a fixed per-kilogram rate and per-item rate if the total inbound flow from a certain country is above 75 tons.

In order to calculate the 2014 terminal dues rates for countries in the target system before any caps and floors are applied, we need information about two reference tariffs:²⁴

- The tariff for a 20 g small (P) priority letter post item in the domestic service (in force at 1 June 2014), converted into SDR (DP1)
- The tariff for a 175 g large (G) priority letter-post item in the domestic service (in force at 1 June 2014), converted into SDR (DP2)²⁵

According to the UPU guidelines, the terminal dues rate per item before caps and floors is 70 percent times the tariff of the 0-20g small letter (DP1) times 0.01 (10 grams assumed to be the average weight for a small letter). In order to calculate per-kilogram rates, a linear relationship between weights and tariffs is assumed. These two rates (per item and per kilogram) are then applied to an item of average weight (assumed by the UPU to be 81 grams in the current system) in order to get the uncapped terminal dues revenue for an average item. If the uncapped revenue is larger than the cap revenue, apply the cap rates, if it is lower than the floor revenue, apply the floor rates, if it is in between, apply the target rate.

The target rate is calculated by multiplying the floor rate, both per item and per kilogram separately, with a ratio of uncapped revenue and floor revenue. This means that if domestic tariffs in one country are high relative to the floor rates, that postal operator will get a higher add-on to the floor rate (but not higher than the cap).

Terminal dues rates per kilogram in the target system are thus calculated as:

$$R_w = 70\% \times \frac{M \times (W_{avg} - 0.01) + DP_1}{R_{wfl} \times W_{avg} + R_{lfl}} \times R_{wfl} \quad (3)$$

²³ UPU, *UPU terminal dues system for the period 2014-2017*, Joint Council of Administration and Postal Operations Council report, Congress-Doc. 20b, 2012.

²⁴ The data is provided by UPU, *Impact tool, version 1 of the 2018-2021 cycle*, 2016

²⁵ Since the estimates of bilateral mail flows relate to the year 2014, we also depart from domestic postage rates for the same year.

And terminal dues rates per item in the target system are calculated as:

$$R_I = 70\% \times \frac{M \times (W_{avg} - 0.01) + DP_1}{R_{wfl} \times W_{avg} + R_{IfI}} \times R_{IfI} \quad (4)$$

where,

M =constant rate of change= $(DP_2 - DP_1) / (0.175 - 0.01)$

DP_1 and DP_2 =Domestic postage rates without VAT for 0-20g P and 100-250g G

W_{avg} =The average weight of an letter post item, set to 81g

R_{wfl} = Floor rate per kilogram

R_{IfI} = Floor rate per item

For each bilateral mail flow the effective rate will depend on (i) the group to which a postal operator belongs, (ii) from which country the inbound mail flow is coming, and (iii) whether or not the terminal dues for the bilateral flow in question is subject to a cap or floor.

Terminal dues rates in the new system

The methodology of the proposed regulatory system is a continuation of the current system. The main difference is a separation of the E-format letters. Whereas the P and G format can be calculated in the same way as before, the E letters now get slightly different parameters. The revenue of a letter of average weight, ie. the numerator in equation (3) and (4), is based on the average weight of a E-letter letter (375gram) and the item and weight rates from the current system. The cap and floor rates are also different for the E-format. In particular, the ratio between the per-item floor rate and the per-kilo floor rate (this is the so-called item-to-kilo ratio) is higher. Although often expressed as a percentage rate by the UPU, it is in practice better described as a weight. It is the weight for which, an item of a specific weight and at a specific kilogram rate, is equivalent to the item charge. A higher item-to-kilo means the structure of the rates is “flatter”, something that is intended to better reflect the price structure of the small packets.²⁶

Table 1 Parameters for the two cycles

	Current system	Proposed system
Average weight P/G/E	81,8g	91,9g
Average weight P/G	n/a	37,6g
Average weight E	n/a	375g
Item-to-kilo ratio P/G/E	0,128	0,128
Item-to-kilo ratio P/G	n/a	0,128
Item-to-kilo ratio E	n/a	0,445

Source: UPU, *UPU terminal dues system for the period 2014-2017*, Joint Council of Administration and Postal Operations Council report, Congress-Doc. 20b, 2012; UPU, Approval of draft Congress-Doc 40 (Proposal for the UPU terminal dues system for the 2018–2021 period), POC 2016.1–Doc 12h, 2016.

Counterfactual terminal dues rates

²⁶ UPU, Approval of draft Congress-Doc 40 (Proposal for the UPU terminal dues system for the 2018–2021 period), POC 2016.1–Doc 12h, para. 22, 2016.

The counterfactual terminal dues rates should ideally reflect (for each country) the price for last-mile handling of cross-border letter post items that a private company (not part of the UPU) would pay. Since the terminal dues are payments for activities in the receiving postal operator's domestic market, this price could be approximated by the price for last-mile handling of domestic letter post items (corrected for any cost difference between domestic and cross-border letter mail).

Neither of these two prices are readily available in the public domain. Moreover, collecting these prices for all postal operators that are part of the UPU system is very difficult, requiring detailed information (for each operator) about (i) the mix of inbound letter post items (formats, weights, address quality etc.) and (ii) prices for last-mile handling of domestic letter post for each format, weight, level of address quality, etc. Collecting these data was not possible within the period and budget of this report.

As a proxy for the counterfactual terminal dues rates, we therefore depart from the domestic (end-to-end) postage rates for single-piece items of three different formats (P, G, E) and weights. This means that we use more granular data than what the UPU uses to calculate terminal dues. In particular, the UPU does not use prices for items of E format (small packages). In order to reflect the price charged for last-mile handling of domestic letter mail, we apply an adjustment factor of 70 percent²⁷.

Instead of making a simple linear relationship between two tariffs, we use information about different weight-steps for three products. Our methodology uses three weight steps for small letters, five weight steps for large letters and seven weight steps for small packets. This allows us to calculate equivalent domestic postage rates that mirror the actual situation better than what would have been the case if only two prices would have been used.

For industrialized countries and all European countries, information about domestic postage rates mainly comes from a survey conducted by WIK consulting, containing a comprehensive overview of domestic postage rates in 2013²⁸. For other countries domestic postage rates are collected from a UPU database with 2008 priority domestic rates by product type and weight step.²⁹ These rates are adjusted based on inflation to create an estimate of tariff levels in 2014.

However, we need to collapse the UPU data on domestic postage rates to a level that fits our counterfactual purposes. For example, for small letters (P) the dataset contains

²⁷ This adjustment factor is the same as used by the UPU for the calculation of uncapped terminal dues for operators in the target system. According to the 25th congress document describing the base for the current terminal dues system: "Domestic tariffs, exclusive of VAT and other taxes, will be used as a reference for calculating TD rates. The percentage of domestic tariffs retained for use is 70%. This figure results from the inbound mail handling cost, calculated based on information from the cost study.", source: UPU (2012), UPU terminal dues system for the period 2014-2017, Joint Council of Administration and Postal Operations Council report.
http://documents.upu.int/Bodies/2012/CNG/CNG%20DOC/MEETING/CNG%20DOC%202012/Doc%2020b/EN/cng_doc_do20b.pdf?Mobile=1&Source=%2F_layouts%2Fmobile%2Fview.aspx%3FList%3D9cab4832-53b8-40f5-9ca4-8566e0ab0364%26View%3D895ea13c-b413-4ce7-b5cb-912051fecf08%26RootFolder%3D%252FBodies%252F2012%252FCNG%252FCNG%2520DOC%252FMEETING%252FCNG%2520DOC%25202012%252FDoc%252020b%252FEN%26CurrentPage%3D1

²⁸ WIK, *Main Developments in the Postal Sector (2010-2013)*, 2013.

²⁹ The database from 2008 is the most recent source available containing such a comprehensive and granular overview of domestic tariffs.

prices for three weight steps, 20g, 50g and 100g for each country. In order to calculate an average postage rate per small letter, we thus need to make assumptions about the distribution of weights. These assumptions are primarily based on a UPU study from 2014³⁰ containing estimated distributions on different weight steps for each product type P, G and E. Since we also have information of average weights of mail flows we can vary the distributions based on average weight. Once the weight distribution for each format is established, it is straightforward to calculate a domestic rate per item for each product type.

In order to correct for the first part of end-to-end delivery activities (collection, transport) which is not part of the last-mile handling, we apply an adjustment factor (70 percent of the domestic postage). It may well be that applying a share of the domestic postage rates for single-piece letters does not reflect the price for last-mile handling of the cross-border letter mail mix. Reasons for this might be that domestic postage rates for single piece letters are regulated, or that low price elasticity of demand for single-piece letters result in higher prices. Nevertheless, since information about special tariffs³¹ (which may constitute a better starting point) often are not available in the public domain, we consider the single piece rates to be a valid starting point similar to what has been done in previous studies.³²

Our data set contains domestic postage rates for 164 countries and territories. Combined with the data set of bilateral mail flows (consisting of 182 countries and territories), this leaves us with a set of 155 designated operators (for which we have estimates of all necessary parameters) to include in the analysis.

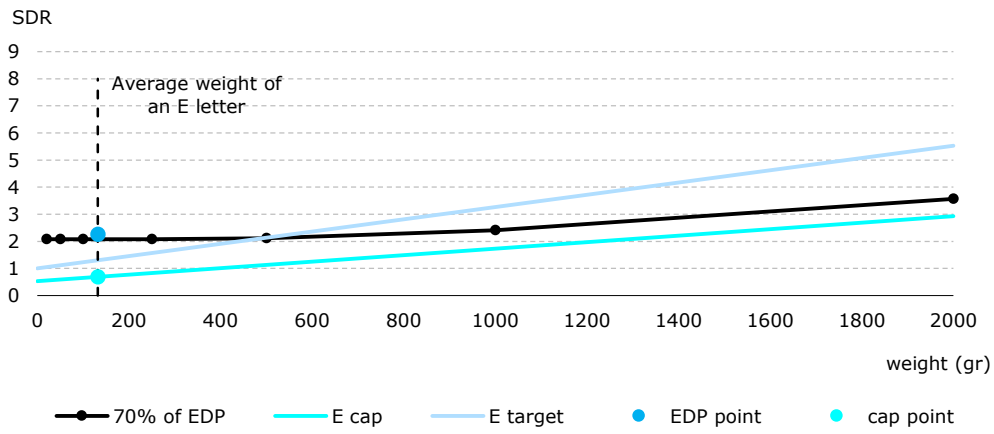
Figure 11 below illustrates the relationship between the terminal dues charges and the equivalent domestic postage. This is the example of an E-letter from China to the US, ie. from group three to group one. The black line illustrates 70 percent of prices of E-letters in the country, for different weight steps. The blue lines represent the terminal dues charges. The light blue shows the target rates for these costs and the darker blue shows the cap rates, which is in fact the one applied in this example. The intercept of the blue lines represents the per-item rate and the slope represents the rate per gram. This can be thought of as the charge for one item. For the terminal dues, however, the rates applied will per design reflect the average item. For our calculation of equivalent domestic postage the rate will reflect a weighted average depending on the distribution of the different weight steps. In this example the blue dot marks the counterfactual rate per item. For a E-letter, being shipped from China to the US, the average weight is around 131 gram. Since the average weight of a E-letter is never above 500 grams the terminal dues will in this case always be below the equivalent domestic postage.

³⁰ UPU, POC C3 LPRG 2014.2 Doc 4a, *Results of the items per kilogramme (IPK) study*, 2014. (committee document).

³¹ Special tariffs are work-sharing discounts applicable to the distribution of bulk mail

³² See for example Campbell, James, *Estimating the effects of UPU terminal dues 2014-2017*, 2014.

Figure 11 Illustration of the discount for a small packet



Source: Copenhagen Economics based on model data

Calculations for net transfers

For each bilateral country pair we thus want to estimate:

$$\begin{aligned}\pi_{ij}^l &= X_{ji}(TD_{ij} - EDP_{ij}) \\ \pi_{ij}^o &= X_{ij}(TD_{ji} - EDP_{ji}) \\ NT_i &= \pi_{ij}^l - \pi_{ij}^o\end{aligned}$$

where π_{ij}^l is country i 's loss (gain) on inbound letter mail from country j expressed as the difference between what country i gets in terms of terminal dues from country j today and what it would get in the counterfactual scenario. X_{ji} is the letter mail flow subject to terminal dues going from country j to country i , TD_{ij} is the actual terminal dues rate that country i receives as revenue from country j and EDP_{ij} is the equivalent domestic postage (i.e. the counterfactual terminal dues rate).

Equivalently, π_{ij}^o is country i 's gain (loss) on outbound letter mail to country j expressed as the difference between what country i pays in terms of terminal dues to country j today and what it would pay in the counterfactual scenario.

NT_i is thus the net transfer for country i related to its bilateral cross border exchange of mail with country j . In order to get the total net transfer for country i , one has to conduct the same analysis for all bilateral mail flows to and from country i .