

## WHY BELGIAN COINS GROW SMALLER

Marc BRYSSAERT &amp; Gery d'YDEWALLE

*Departement Psychologie  
Katholieke Universiteit Leuven*

It is argued that the decrease in size of Belgian coins is not only due to economic reasons (production costs, number of coins with a value less than one Franc), but also to the "appeal" of the coins. The appeal involves two components: The purchasing-power of the Franc, and the prosperity of the Belgian people. An empirical study that supports the argument is presented.

On July 1, 1989, the Belgian one Franc coin (1 BEF) was replaced by a new one. The diameter of the new coin amounts to 18 mm as opposed to the old 21 mm. A survey of the history of the Belgian Franc (Van Keymeulen & Suetens, 1977) reveals that the decrease in size of 1989 is the third one: In 1833, the first Franc was coined with a diameter of 23 mm, which persisted till 1939 when it was reduced to 21.5 mm. In 1950, a second reduction to 21 mm was effected.

Three major reasons may be formulated for the decreasing size of the Franc. The first two, which we will call economic reasons, are the production costs of the coin, and the number of coins with a value less than 1 BEF. The third reason concerns the appeal of the coin and is for the larger part a psychological factor.

The decrease in production costs is the major reason given by the "Koninklijke Munt van België" (KMB) and the media for the 1989 reduction in diameter of the 1 BEF coin. The manufacturing expenses of an old 1 BEF piece were larger than its value: 1.5 BEF compared to 1 BEF. However, there are two considerations which diminish the importance of this explanation. First, it is not clear why precisely the diameter has to be smaller in order to reduce the costs; a similar reduction could be achieved by changing the alloy. Second, it does not explain why the KMB brought out a 50 BEF piece in 1987 with a diameter of 22 mm.

The number of coins with a value less than 1 BEF may be another factor in the decision to decrease the size of the 1 BEF coin. If the Franc has a high purchasing-power, several coins will exist with a lower value, and the size of a Franc coin will have to be large enough to distinguish it from the "smaller" coins. For instance, around 1860 there were about seven coins with a value less than 1 BEF, namely the coins of 50, 25, 20, 10, 5, 2, and 1 centimes (= one hundredth of a Franc).

Nowadays, there is but one coin with a value less than 1 BEF, the coin of 50 centimes, which probably will disappear in the near future. Thus, today's 1 BEF coin can take over the size of the 2 centimes coin from 1860.

However, the above explanation only makes sense if a positive correlation exists between the value of a coin and its size. A closer look at the history of the Belgian Franc reveals that this is not generally the case. In 1860, a clear distinction was made between the silver coins (to which the 1 BEF belonged) and the brass coins (to which most of the coins below 1 BEF belonged). Thus, at that time a silver coin of 1 BEF with a diameter of 23 mm coexisted with a brass coin of 10 centimes that had a diameter of 32 mm, and a gold coin of 10 BEF with a diameter of 18 mm (the diameter of the 2 centimes coin was 22 mm). This had much to do with the purchasing-power of a coin being equal to the value of the alloy in the nineteenth century, but even nowadays we see that a coin of 50 BEF with a diameter of 22 mm coexists with coins of 5 and 20 BEF that have a diameter of respectively 24 and 25 mm. Consequently, the number of coins with a value less than 1 BEF can hardly be an important factor for the size of the 1 BEF coin.

The third reason for the decreasing size is what we have called the appeal of the coin. This involves two separate components. First, if the purchasing-power of the Belgian Franc drops, the coin of 1 BEF loses attraction. Second, the attraction of a 1 BEF piece will be smaller for a rich person than for a poor one. The importance of the first component can be inferred from a study by Lea (1981). Subjects who were asked, in 1976, to estimate the size of British coins under the coins' current names or under their names before decimalization in 1971, gave bigger estimates when given the old names. Lea (1981) submitted that this difference should be attributed to the loss in value of the coins since 1971. The relationship between the size of a coin and its purchasing-power can be further inferred from a double observation. First, in most countries there is a tendency towards a positive relationship between the purchasing-power and the size of a coin (but see above for counter-examples), and if the relationship is distorted (as happened in Belgium with the introduction of a new 50 BEF coin with a diameter of 22 mm), popular reaction is unfavorable (see the empirical study below). Second, if we compare the size of the 1 BEF coin with that of the monetary unit coin of neighboring countries (France, Great Britain, the Netherlands, Germany), we see that it is smaller. This coincides well with the observation that the purchasing-power of the monetary unit coins in

the neighboring countries is higher than that of the Belgian Franc. A more powerful test would be to correlate the size of the monetary unit coins in different countries with their purchasing-power at the time of introduction. Figure 1 shows the evolution of the purchasing-power of 1 BEF from 1835 till 1988.<sup>1</sup> As can be seen, the power dropped from an equivalent of approximately 170 BEF around 1900 to an equivalent of 1 BEF in 1988.

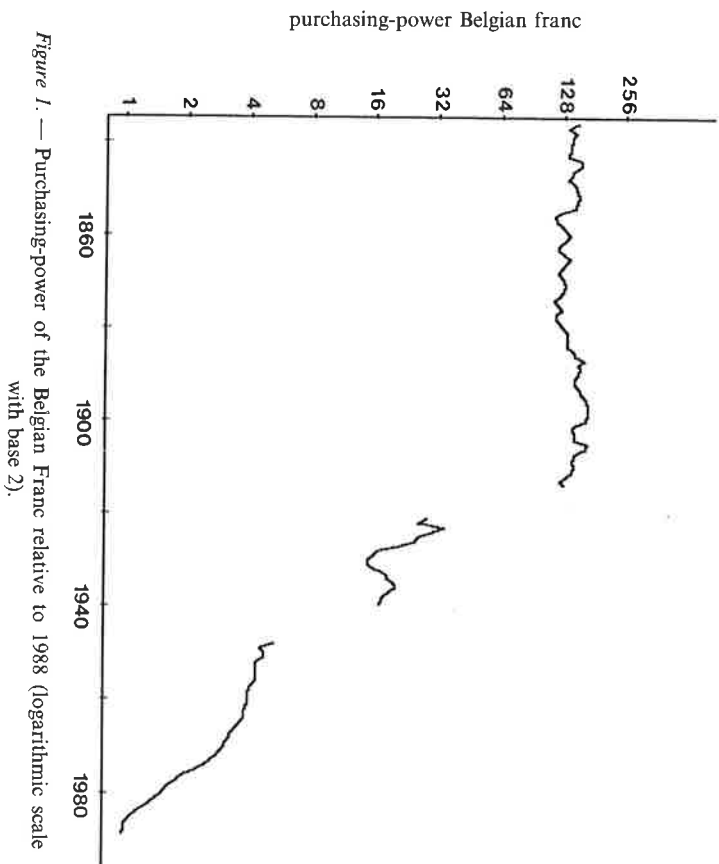


Figure 1. — Purchasing-power of the Belgian Franc relative to 1988 (logarithmic scale with base 2).

The influence of the prosperity of a people on the size of the 1 BEF coin may seem counter-intuitive at first sight, but the psychological literature provides us with quite pertinent evidence. Bruner and Good-man (1947), in what has now become a classical study, were the first to show that there is a negative relationship between the wealth of a person and the perception of the coin size: They were able to demon-

<sup>1</sup> We wish to thank the Workshop on Quantitative Economic History at the University of Leuven for providing us with the information for Figures 1 and 2. The reader may also wish to consult the *Statistisch Jaarboek van België* published annually by the "Nationaal Instituut voor de Statistiek".

strate that poor children overestimated the size of coins more than rich children did. Moreover, the extent of overestimation correlated accurately with the value of the coins (except for the coins with a very high value). The study has since been replicated several times in different cultures (see e.g. Dawson, 1975). A question with respect to the Bruner and Goodman (1947) study, however, is whether we can extend their results from 10-year-old children to a whole nation (of adults). Although this may not appear to be evident at first sight, Hitchcock, Munroe, and Munroe (1976) indicate that we indeed may do so. For 84 different countries, they correlated the gross national product per capita with the mean diameter of all coins under first currency unit and obtained a Spearman rank-correlation of  $-.19$  ( $p < .05$ ), which indicates that poor countries indeed tend to mint larger coins than rich countries. Whether we can extend the Hitchcock, Munroe, and Munroe (1976) finding to the Belgian situation is a question that will be addressed in the next section. Figure 2 first shows the increase in gross national product per capita in Belgium from 1920 till 1986 (data prior to 1920

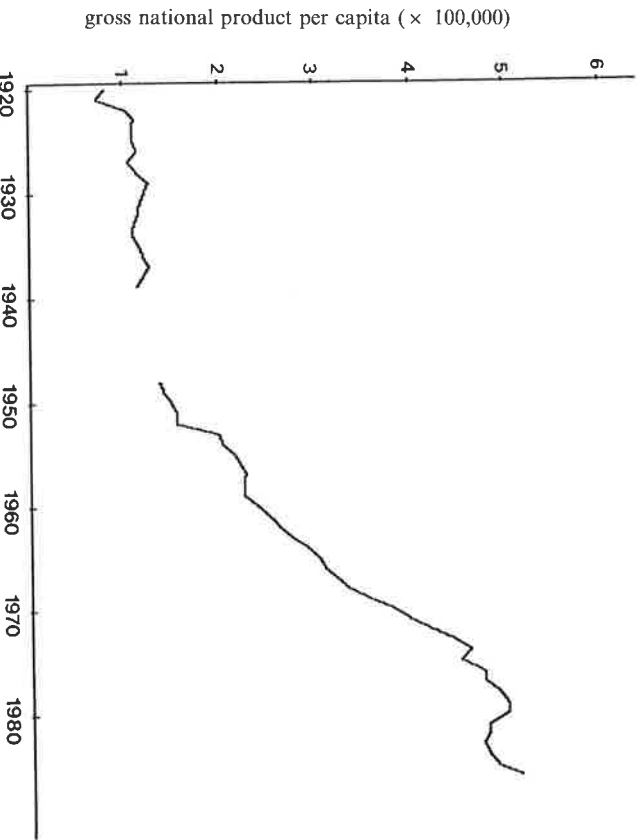


Figure 2. — Gross national product per capita from 1920 until 1986 (corrected for differences in purchasing power of the BEF, base = 1986).

are not yet available); it goes from a minimum of 71,592 BEF in 1921 to a maximum of 516,313 BEF in 1986. The data have been modified in order to accommodate differences in the purchasing-power of the Belgian Franc (base = 1986).

#### AN EMPIRICAL STUDY

Because the relationship between the prosperity of a people and the size of its coins is the most important factor from a psychological point of view (and probably the most controversial factor for non-psychologists), we decided to run a small study to check the validity of the statement, as a complement to the studies of Bruner and Goodman (1947), and Hitchcock, Munroe, and Munroe (1976) mentioned before.

Two different groups were delineated: A high-income group and a low-income group. Because the personal wealth of people is a very private matter, the exact data relative to it are not readily accessible and we therefore decided to use a more overt indication of prosperity than the answer to the direct question how much a person earned and owned. For the high-income group, well established merchants were chosen who ran (and probably owned) a large store and preferentially had at least one full-time employee working for them. Merchants were chosen because their mean age of school termination is comparable to that of the low-income group (see control variables). The group includes bakers, butchers, café proprietors, electricians, shopkeepers, tailors, and other similar sub-groups. The low-income group consisted of people living in a building of the welfare services, who not only pay a fairly low rent, but also have to prove that their income does not exceed a certain (low) level before they can be allotted such an apartment.

Data from 22 high-income and 24 low-income persons were gathered. The high-income group was visited first. Five questions were asked: (a) "If you were to be in charge of deciding how large the coins must be, what size would you choose for a coin of 1 BEF, a coin of 5 BEF, a coin of 20 BEF, a coin of 50 BEF, and a (not yet existing) coin of 100 BEF?"; (b) "What is your sex?"; (c) "What is your age?"; (d) "When did you leave school?"; (e) "How many people do you employ?" To answer question (a), subjects were given a red cardboard of 24 x 32 cm to which yellow circles with a diameter ranging from 10 mm to 50 mm were attached. Step size was 1 mm, except for the circles smaller than 16 mm and larger than 44 mm where step size was 2 mm. Subjects were asked to indicate what size they preferred. Question (b), (c), and (d)

dealt with control variables, which were entered to make sure that any difference between the high- and the low-income group was not due to more "prosaic" variables such as age, intelligence or gender. Question (e) was asked because it is not unreasonable to assume that the number of employees is a further indication of the prosperity of the subjects in the high-income group. There were 13 male and 9 female subjects in the high-income group. Age ranged from 25 to 68, with a mean of 42.5. Average age of school termination was 18.8 and ranged from 14 to 23. Mean number of employees amounted to 5.2, ranging from zero (three cases) to 13 (one case).

After the high-income group, the low-income group was visited. The researcher took up his position at the entrance of the building block and picked out a group of residents the variable-distribution of which, at least as far as sex and age were concerned, more or less matched that of the high-income group. Data from 14 males and 10 females were gathered. Age of the subjects ranged from 19 to 76 years with a mean of 46.3. Age of school termination varied between 14 and 22 years, and had an average of 17.5. ANOVA's indicated no significant difference between the high- and the low-income group for any of the control variables.

Although this was not explicitly requested, most subjects readily offered comments on the questions and the existing coins. These remarks were noted and will be summarized at the end of the section. The study was finished in April 1989, some months before the introduction of the new 1 BEF coin.

Figure 3 displays the mean size of the coins pointed to by the high- and the low-income subjects. An Analysis of Covariance with two variables (Group and coin Value) and three covariates (Age, Year of school termination, and Gender) indicated that both main effects and the interaction effect are significant (Group: mean size high-income = 25.95, mean size low-income = 29.09,  $F(1,41) = 6.17, p < .025$ ; Value: 1 BEF = 20.02, 5 BEF = 24.11, 20 BEF = 27.85, 50 BEF = 30.67, 100 BEF = 35.30,  $F(4,176) = 223.66, p < .0001$ ; Interaction:  $F(4,176) = 2.86, p < .05$ ). No covariate had a significant contribution (all  $F_s < 1$ ).

The main effect of Group confirms the hypothesis that poorer people prefer larger coins than richer people do. If we confine our attention to the 1 BEF piece, we observe that the high-income group would like to see a new coin of 19.1 mm (not far from the 18 mm it is from July 1,

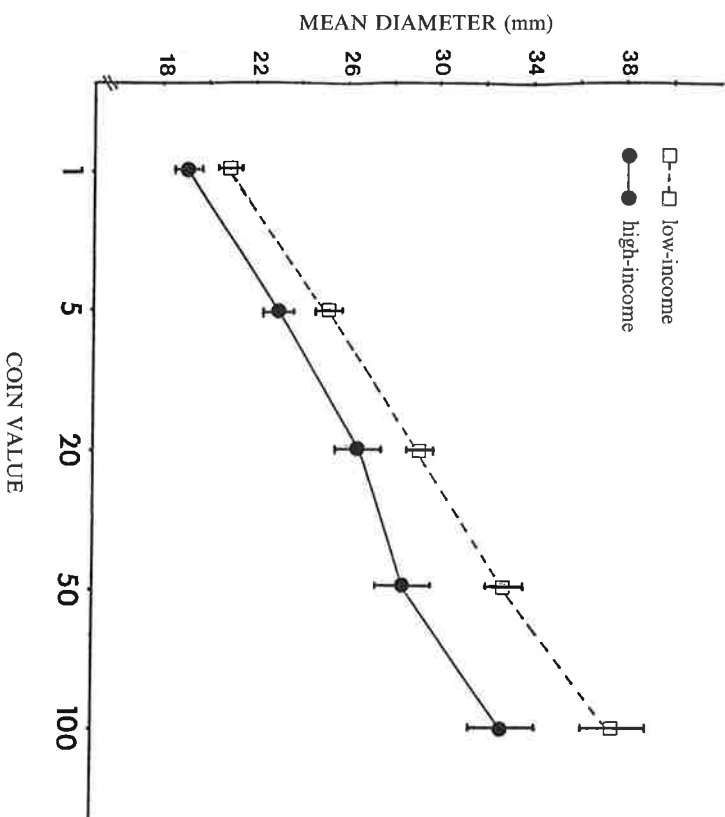


Figure 3. — Mean preferred coin diameter as a function of income and coin value (with standard deviation of cell means).

1989), while the low-income persons remain quite close to the old diameter (20.9 mm against 21 mm).

The interaction between Group and Value is for the greater part due to the increasing difference between the groups as the coins grow larger. A posteriori tests<sup>2</sup> (Tukey) reveal that the difference between the groups is only significant for the 50 BEF and the 100 BEF coins. No significant difference is obtained for the 1 BEF, the 5 BEF, and the 20 BEF coins. The increasing difference as a function of the coin value can be explained by two factors: A perceptual one and a motivational one. The motivational factor is an extension of the Group effect and says that the increase in size due to an increase in value needs to be larger

<sup>2</sup> The a posteriori tests are based on the raw data, using the sum of squares of a simple split plot design without covariates. Because no covariate has a significant contribution, there is no need to work with adjusted means. The  $F$  value for Group in the simple split plot design is  $F(1,44) = 7.35, p < .01$ . The  $F$  values for coin Value and the interaction, of course, are the same as in the Analysis of Covariance.

for poor people than for rich people (you must "see" the difference). The perceptual factor says that two coins must differ from each other by a certain proportion to be well discernable. A difference between the smallest coins then leads to an ever increasing difference between the larger coins (e.g. if coins must differ by an amount of 10% to be discernable and if the smallest coin of one series is 20 mm and that of a second series 30 mm, we get a series of 20, 22, 24.2, 26.6, 29.3, ... and a series of 30, 33, 36.3, 39.9, 43.9, ...). To see which of the two factors is more plausible, an ANOVA (without covariates) was run on the divisions of 5 BEF/1 BEF, 20 BEF/5 BEF, 50 BEF/20 BEF, and 100 BEF/50 BEF. But one effect remained significant: The main effect of Division Value (5 BEF/1 BEF = 1.21, 20 BEF/5 BEF = 1.15, 50 BEF/20 BEF = 1.10, 100 BEF/50 BEF = 1.14,  $F(3,132) = 11.33$ ,  $p < .0001$ ). The main effect of Group (high-income = 1.15, low-income = 1.16,  $F(1,44) = 0.75$ ,  $p > .20$ ) and the interaction effect ( $F(3,132) = 1.44$ ,  $p > .20$ ) disappeared. Thus, the major reason for the interaction effect is very probably a perceptual factor: Coins must differ by a certain proportion (about 15%) to be well discernable. If the motivational factor had been the main determinant, we would have expected a main effect of Group and (possibly) an interaction effect. The main effect of Value indicates that the proportion to be added changes between the different values. It is greater between 5 BEF and 1 BEF (21%) than between 50 BEF and 20 BEF (10%).

Further evidence for the adequacy of the hypothesis that "poorer" people like larger coins than "richer" people is obtained when we look at the high-income group and correlate the number of employees with the mean preferred coin size. Because the number of employees can be considered as an indication of prosperity, a significant negative correlation is to be expected, and we indeed found one ( $r = -.46$ ,  $p < .05$ ), even if the effect of the control variables (age, year of school termination, gender) is partialled out ( $r = -.55$ ,  $p < .05$ ). The more persons merchants have working for them, the smaller the coin size they prefer. The significant correlation for the high-income group is especially interesting because it runs against all explanations that the difference between the high-income and the low-income group is due to differences between merchants and non-merchants.

The comments people gave, concerned three main topics. First, all subjects but one preferred a positive relationship between the size of a coin and its value. A considerable number of remarks concerning the 50 BEF piece were made. This agrees with our argument that the

purchasing-power is part of the appeal of a coin. Second, people wanted the coins to be clearly differentiated, either by an obvious difference in size (around 15%),<sup>3</sup> or by a clear difference in shape or color. Finally, a majority of the subjects (of both groups) was reluctant to accept very large coins, because they are too heavy to carry along. The two last observations conflicted with each other for most people, and therefore they suggested that greater differences in shape should be made in the future and that no piece of 100 BEF should be introduced. Everyone preferred banknotes of 100 BEF. The reluctance to accept overly large coins probably also explains why the difference between the "poor" and the "rich" group for the large coins is not bigger than is explained by perceptual reasons.

#### CONCLUSION

This article has defended the thesis that one of the major factors why Belgian coins grow smaller, is of a psychological nature and concerns the "appeal" of the coin. The larger the purchasing-power of a Franc (Figure 1) and the poorer the people (Figure 2), the bigger a piece of 1 BEF must be. The validity of the statement was supported by a (brief) literature survey and an empirical study. It was indicated that people prefer a positive relationship between the purchasing-power and the size of coins, and that the preferred size of coins is influenced by factors such as income and number of employees, both indications of personal prosperity.

Apart from the main question addressed above, the study also gives some information concerning the preference of the Belgian people for the coins they must use. A new coin of 1 BEF with a diameter of 18 mm (which is either an indication of the prosperity of those who have decided to introduce the coin, or an indication of what the Belgian economy is supposed to do in the future) goes along with a coin of 5 BEF that has a diameter of at least 20.7 mm (+ 15%) or a different shape, a coin of 20 BEF that has a diameter of 23.8 mm, a coin of 50 BEF with a diameter of 27.4 mm, and no coin of 100 BEF (see,

<sup>3</sup> Vroon (1978), using a different paradigm, found that the optimal difference in diameter between two coins is 30%. This would imply diameters of 18, 23.4, 30.4, and 39.5 mm for the 1 BEF, the 5 BEF, the 20 BEF, and the 50 BEF coin respectively. In this case, differences in color and shape would definitely be preferred by our subject pool. Some research about the latter variables has been done by Bruce and her colleagues (Bruce, 1989; Bruce, Gilmore, Mason, & Mayhew, 1983; Bruce, Howarth, Clark-Carter, Dodds, & Heyes, 1983).

however, note 3). Though we know that the introduction of new coins in Belgium has never been a very democratic process, the KMB might as well take the wishes of the people into account. For it has been proven that even their institution-level decisions follow strict psychological rules.

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Tiensestraat 102  
3000 Leuven

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